

No. 5. — *Reports on the Dredging Operations off the West Coast of Central America to the Galapagos, to the West Coast of Mexico, and in the Gulf of California, in charge of ALEXANDER AGASSIZ, carried on by the U. S. Fish Commission Steamer "Albatross," during 1891, LIEUT. COMMANDER Z. L. TANNER, U. S. N., Commanding.*

XXIII.

*Preliminary Report on the Echini.* By ALEXANDER AGASSIZ.

THE following brief descriptions, accompanied with figures of the more interesting species, collected during the "Albatross" Expedition of 1891, are published to prevent possible confusion in the names adopted for the new species of sea-urchins, which will appear on the Plates preparing for the final Report.

As regards the distribution of Echini in the Pacific, we have at the present day a condition of things very similar to that which must have prevailed in the Atlantic when the species of Echini living in the Crag and in the Maltese beds had their representatives in the West Indies, having, as has been suggested, found their way from the Mediterranean along the shores of an ancient continent. Some of the species living on the west coast of Central America have a very extended geographical distribution in the Pacific, and yet no one claims that this great range has been brought about by their migration along the shores of a continent, or continental islands, existing between Panama and the Sandwich Islands or the Marquesas.

The great equatorial current gives us a cause fully efficient to effect such a wide distribution, and that in a comparatively short time. While undoubtedly many of the species of Echini have no pelagic Plutei, and are so to speak viviparous, or carry their young for a considerable period, yet we should remember that young Echini, even after they have assumed the characters of the adult, are capable of being transported

long distances by currents. It is not an uncommon thing to find the young of *Arbacia*, of *Strongylocentrotus*, and of *Echinarachnius* on our coasts floating about, and they are not unfrequently caught in the surface tow-net. The same holds good for many species of Starfishes and of Ophiurans, as well as of Holothurians. In Florida I have caught in the same way the young of *Cidaris* and *Hipponoe*, and of *Toxopneustes*, and of many other species of Starfishes and Ophiurans. These young Echinoderms all float, and may be carried very long distances during the period in which they still have the huge embryonic tentacles characteristic of their younger stages, when the ambulacral feet are entirely out of proportion in size to the rest of the test, and the young thus possess a great floating capacity when their suckers are expanded.

They retain these suckers for a considerable period of time, during which they can be transported very great distances. There is no other explanation for the identity of the littoral marine fauna of the Bermudas than that the young and embryos of the Echinoderms and Polyps of the West Indies have been carried northward fully six hundred miles by the Gulf Stream at a rate of from one to three miles a day, and have finally settled in the Bermudas.

We can well imagine an equatorial current taking during Miocene and Eocene periods the young of the Echini flourishing in the Crag and in the Mediterranean, and in the southern extension of that fauna perhaps only from the Cape Verd Islands, and bringing them to the shores of Northern South America or into the Caribbean Sea. That stretch is but little longer than the stretch which we know is annually traversed by Acalephs, Pteropods, Fishes, and Annelids, along the course of the Gulf Stream from the Straits of Florida to Narragansett Bay, and to the southern shores of Cape Cod and the adjacent islands.

The existence of a continent or of intervening islands does not seem to me necessary to explain the similarity of the Echinid fauna of former times on both sides of the Atlantic or Pacific. The causes now at work appear to me sufficient to explain their relationship, when we take into account what is known of the efficient transporting agency of equatorial or other oceanic streams for the Pluteus or the young stages of Echini during a considerable period of their post-embryonic life.

We should also remember that, even with our imperfect knowledge of the bathymetrical range of Echini, the range in depths of many genera is known to be very great, as will be seen from an examination of the lists given in the "Challenger" Reports and from the depths obtained by this Expedition. Among these I may mention those having a great

geographical distribution, as well as a wide bathymetrical range.<sup>1</sup> This will serve to show the extent to which many species can slowly migrate upon the bottom, even at a very considerable distance from land or continental or insular slopes, when living in the track of a great equatorial current which supplies them with a constant and abundant supply of food.

## DESMOSTICHA, HAECKEL.

### CIDARIDÆ, MÜLL.

#### GONIOCIDARIDÆ, HAECKEL.

##### *Dorocidaris panamensis* A. Ag.

Plate I; Plate II. Fig. 1.

The test of this species is greatly flattened; the primary radioles are short, in many specimens not longer than the diameter of the test; they are comparatively slender but with a coarser granulation than in the Atlantic species (*D. papillata*). The abactinal system is also smaller, the anal system more pentagonal, and the genital plates more elongate than in the *D. papillata*, and the actinal spines are smaller than in that species.

Station No. 3367, off Cocos Island, 100 fathoms.

" " 3368, off Cocos Island, 66 fathoms.

" " 3378, off Galera Point, 112 fathoms.

" " 3397, off Galera Point, 85 fathoms.

##### *Goniocidaris Doederleini* A. Ag.

Plate III. Fig. 1.

The nearest ally of this species is *G. canaliculata*, from which it is readily distinguished by the greater flatness of the test and the very slender primary

| Genera.                                   | Range in fathoms. | Genera.                        | Range in fathoms. |
|---|-------------------|--------------------------------|-------------------|
| <sup>1</sup> <i>Dorocidaris</i> . . . . . | 874               | <i>Hipponoë</i> . . . . .      | 451               |
| <i>Porocidaris</i> . . . . .              | 1444              | <i>Fibularia</i> . . . . .     | 950               |
| <i>Goniocidaris</i> . . . . .             | 1975              | <i>Pourtalesia</i> . . . . .   | 2550              |
| <i>Salenia</i> . . . . .                  | 1850              | <i>Homolampas</i> . . . . .    | 1600              |
| <i>Podocidaris</i> . . . . .              | 1075              | <i>Maretia</i> . . . . .       | 800               |
| <i>Cœlopleurus</i> . . . . .              | 1323              | <i>Echinocardium</i> . . . . . | 2075              |
| <i>Aspidodiadema</i> . . . . .            | 1800              | <i>Hemiaster</i> . . . . .     | 400               |
| <i>Dermatodiadema</i> . . . . .           | 800               | <i>Brissopsis</i> . . . . .    | 2435              |
| <i>Phormosoma</i> . . . . .               | 1100              | <i>Acrope</i> . . . . .        | 600               |
| <i>Temnechinus</i> . . . . .              | 600               | <i>Cystechinus</i> . . . . .   | 900               |
| <i>Trigonocidaris</i> . . . . .           | 460               | <i>Urechinus</i> . . . . .     | 600               |
| <i>Echinus</i> . . . . .                  | 2400              | <i>Periaster</i> . . . . .     | 1800              |
| <i>Sphærechinus</i> . . . . .             | 400               | <i>Schizaster</i> . . . . .    | 1400              |

radioles. When alive the bare spaces of the test are of a deep brownish violet, the primary spines reddish, and the miliaries greenish with brownish longitudinal bands. The sutures of the genital and ocular plates are marked by a sharp violet line and the genital system is comparatively bare and free from miliaries.

Station No. 3369, off Cocos Island, 52 fathoms.

Two new species of *Porocidaris* were dredged by the "Albatross."

### *Porocidaris Milleri* A. Ag.

#### Plate IV.

This species is closely allied to *P. elegans* collected by the "Challenger." Its radioles differ from those of the Challenger species in having finer serrations. The actinal system is marked for the prominent development of the interambulacral plates, while in *P. elegans* the actinal system is paved with ambulacral plates (Agassiz, Chall. Echini, Plate III. Fig. 3). The primary tubercles of this species are not crenulate as they are in the other species of the genus, but the species possesses the remarkable primary actinal radioles which are so characteristic of the genus. The median interambulacral suture is bare of miliaries, while in *P. elegans* the presence of the closely packed miliaries conceals the suture.

Station No. 3359, off Cape Mala, 465 fathoms.

" " 3360, off Cape Mala, 1672 fathoms.

" " 3381, off Malpelo Island, 1772 fathoms.

" " 3399, off Galera Point, 1740 fathoms.

" " 3415, off Acapulco, 1879 fathoms.

### *Porocidaris Cobosi* A. Ag.

#### Plate III. Figs. 2-5.

This species is readily recognized by its comparatively small actinal and abactinal system. The primary radioles recall those of the Atlantic species *P. Sharreri*. In the ambulacral zone the primary miliaries are larger than those surrounding the scrobicular area of the primary tubercles in the interambulacral area. The primary mammary bosses are perforated and crenulated; the scrobicular area is narrow.

Station No. 3404, off Chatham Island, 385 fathoms.

### SALENIDÆ, AGASS.

#### *Salenia miliaris* A. Ag.

#### Plate II. Figs. 2-4.

This species can at once be distinguished from its Pacific congeners by the great size of the anal system, which is irregularly hexagonal and covered with

a comparatively larger number of plates than in the other pacific species. The primary radioles are marked for the great development of the milled ring. The primary ambulacral tubercles are small and the two vertical rows are separated by a wide band crowded with minute miliaries. Some of the primary radioles are curved at the extremity and their great length is very striking. In a specimen measuring 12 mm. in diameter, the radioles were slightly over 60 mm. in length.

Station No. 3357, off Mariato Point, 782 fathoms.

" " 3360, on way to Cocos Island, 1672 fathoms.

" " 3361, on way to Cocos Island, 1471 fathoms.

" " 3362, on way to Cocos Island, 1175 fathoms.

" " 3376, South of Malpelo Island, 1132 fathoms.

" " 3380, off Malpelo Island, 899 fathoms.

" " 3407, Galapagos Islands, 885 fathoms.

" " 3411, Galapagos Islands, 1189 fathoms.

" " 3413, Galapagos Islands, 1260 fathoms.

## ARBACIADÆ, PETERS.

At Station 3382 in 1793 fathoms we dredged a single specimen of a species constituting a new genus (*Dialithocidaris*), and one which we may consider as the Pacific representative of *Podocidaris* of the West Indies. I am inclined to consider as also belonging to this genus *Podocidaris prionigera* A. Ag., which when described was referred with considerable doubt to the genus *Podocidaris*.

## DIALITHOCIDARIS, A. AG.

The genus is marked by the great size of the genital and ocular plates of the apical system; by the width of the interambulacral area, by the peculiar linear arrangement of the large interambulacral miliaries along the median line parallel with the horizontal sutures of the upper interambulacral plates. The plates nearer the ambitus and on the actinal surface each carry two primary tubercles. The ambulacral plates carry one primary tubercle. The sutures of the abactinal coronal plates are somewhat sunken and bare, as in some species of *Goniocidaris*.

### *Dialithocidaris gemmifera* A. Ag.

#### Plate V. Figs. 1, 2.

There are only four anal plates in the single specimen we dredged. The genital and ocular plates are crowded with irregularly arranged sessile spines, either globular or clubshaped. The madreporite is well developed. The actinal system is marked by ten large elliptical plates placed in the extension of the ambulacral system. The longest primary radioles are 8 mm. in length,



flattened, fluted and serrated on the edges, and are comparatively smaller and more slender than in species of the allied genus *Podocidaris*. The diameter of the test of this specimen was 21 mm. when alive. The color of test and spines is yellowish brown.

## DIADEMATIDÆ, PETERS.

### DERMATODIADEMA, A. Ag.

This genus holds the same relation to *Aspidodiadema* which *Echinothrix* holds to *Diadema*. It differs from it in having only small secondary tubercles in the ambulacral areas while in *Aspidodiadema* there are large primary tubercles in the actinal region, as in *Hemicidaris*.

#### *Dermatodiadema globulosum* A. Ag.

Plate V. Figs. 3, 4.

Marked for its high test, the five large plates surrounding the anal opening, the great width of the ambulacral area, and the stout primary interambulacral radioles, and the deep furrows of the scrobicular area. The longest specimen collected measured 22 mm. in diameter, the largest primary radioles are nearly twice the length of the diameter of the test.

Station No. 3381, north of Malpelo Island, in 1772 fathoms.

“ “ 3398, off Galera Point, in 1573 fathoms.

#### *Dermatodiadema horridum* A. Ag.

Plate V. Figs. 5-7.

This species has a comparatively large apical system. The anal system is covered by a large number of small plates, a ring of seven or eight somewhat larger plates surrounding the anal opening. The greater number of specimens were about 20 mm. in diameter, the apical system measuring 14 mm. across. It is probable that *Aspidodiadema antillarum*, collected by the “Blake,” will have to be transferred to *Dermatodiadema*, the lack of material inducing me to associate it with *Aspidodiadema*, although it possesses the miliary primary ambulacral tubercles characteristic of the genus *Dermatodiadema*. Test dark claret color, primary radioles pinkish.

Station No. 3362, between Cocos Island and Mainland, in 1175 fathoms.

“ “ 3363, between Cocos Island and Mainland, in 978 fathoms.

“ “ 3364, between Cocos Island and Mainland, in 902 fathoms.

“ “ 3375, south of Malpelo Island, in 1201 fathoms.

“ “ 3376, near Malpelo Island, in 1132 fathoms.

“ “ 3381, north of Malpelo Island, in 1772 fathoms.

“ “ 3398, off Galera Point in 1573 fathoms.

“ “ 3400, from Galera Point to Galapagos, in 1322 fathoms.

“ “ 3413, northwest of Culpepper Island, Galapagos, in 1360 fathoms.

## ECHINOTHURIDÆ, WYV. THOMS.

*Phormosoma panamensis* A. Ag.

The specimens of this species were all in a poor condition; they are allied to *Ph. tennis*, but this species is interesting in having on the actinal side the characters of *Phormosoma* most decidedly developed, while on the abactinal side the great elongation of the ambulacral plates and the arrangement of the coronal plates resemble the structural features of *Asthenosoma*. Better preserved specimens may show this species to belong to a new genus of the family intermediate between *Phormosoma* and *Asthenosoma*.

Station No. 3374, southwest of Malpelo Island, in 1825 fathoms.

*Phormosoma hispidum* A. Ag.

## Plate VI., Plate VII.

This species is the Pacific representative of the Caribbean and Northern Atlantic *Ph. uranus*; it has like it an extensive geographical range, but in comparatively deeper water. The largest specimens collected measured 201 mm. in diameter. The test is marked for the great width of the ambulacral system at the ambitus, which is nearly as wide as the adjoining interambulacral system. The large primary radioles of the actinal edge are slightly curved and tipped. On the abactinal side of the ambitus the coronal plates both ambulacral and interambulacral carry only one small secondary tubercle on the distal extremity of the plate with a few irregularly scattered miliaries. The outer primary row of interambulacral tubercles extends on half the coronal plates, the inner row only on two or three of them.

## PETALOSTICHA, HÆCKEL.

## SPATANGIDÆ, AGASS.

## POURTALESIDÆ, A. Ag.

*Pourtalesia Tanneri* A. Ag.

## Plate VIII. Figs. 1, 2.

This species is closely allied to *P. laguncula* (Challenger Echini, Plate XXII.\* Figs. 7-15, Plate XXXI. Figs. 1-11), but differs from it in the shape of the test, which is less bottle-shaped, the greater height of the anterior extremity of the test, the concentration of the primary tubercles on the sides of the test in more or less parallel rows in a triangular space extending from the anal system to the lower angle of the ambitus, and the greater length of the

primary spines on the flanks of the test. The actinal side of the test is flatter than in *P. laguncula* and the proboscis runs at a less angle from the plane of that surface. The color of the test is pinkish; the radioles are white.

Station No. 3411, between Bindloe and Wenham Islands, in 1189 fathoms.

“ “ 3431, off Altata, Gulf of California, in 995 fathoms.

### PLEXECHINUS, A. Ag.

Only two specimens of this interesting genus were collected. This genus is peculiar as combining some of the features of *Urechinus* and *Pourtalesia*. It has the flush actinostome of the former genus, and at the apex the widely separated bivium and trivium of *Pourtalesia*, with simple ambulacral pores, a slightly developed anal proboscis, a sunken anal system, and a well developed broad subanal fasciole.

#### *Plexechinus cinctus* A. Ag.

##### Plate VIII. Figs. 3, 4.

Seen in profile, the test slopes very gradually from the bivium towards the rounded anterior extremity. The posterior end is truncated, deeply scooped out above the broad anal proboscis for the reception of the anal system. The anal proboscis is rounded, curved back anteriorly, and is gradually lost in the keel of the actinal plastron. The anal proboscis is banded by a wide fasciole, extending far beyond the posterior edge of the anal system to the keel of the actinal plastron. On the actinal side the posterior ambulacral areas are broad and bare. At the anterior extremity towards the ambitus the test is closely covered by primary tubercles; they become smaller as they pass beyond the ambitus and cover the abactinal area, and are quite regularly scattered over the test with somewhat distant minute miliaries in the intertubercular spaces. The anal system is transversely elliptical, strengthened by eight large trapezoidal plates surrounding the central anal opening.

Station No. 3424, off Tres Marias, Gulf of California, in 676 fathoms.

#### *Echinocrepis setigera* A. Ag.

##### Plate XIII.

Although a number of fragments of this species were collected, only a single fairly complete specimen was obtained from Station 3399. It measured 99 mm. in length, 51 mm. in greatest width, and 53 mm. in height. The test was of chocolate color; the primary spines from 20 to 22 mm. long were pinkish. This species is at once distinguished from *E. cuneata* by the great elongation of the odd interambulacrum and the more rounded outline of the test, which is far less angular than that of *E. cuneata* (Challenger Echini, Plate XXVII. Figs. 1-5). The anterior ambulacral groove is but slightly depressed above the ambitus; the actinal pouch is entirely on the oral surface, and the anterior ex-



tremity does not pass, as in *E. cuneata*, into the anterior ambulacral groove. The actinal system is protected by five large plates.

Station No. 3398, off Galera Point, in 1573 fathoms.

“ “ 3399, off Galera Point, in 1740 fathoms.

“ “ 3415, off Acapulco, in 1879 fathoms.

### *Urechinus giganteus* A. Ag.

#### Plate VIII. Figs. 7, 8.

At Station No. 3431 two specimens of *Urechinus* were collected, much larger than those of any of the species dredged by the “Challenger” or the “Blake,” the largest specimen measuring 93 mm. in length, 80 mm. in width, and 39 mm. in height. This species is also remarkable for the great length of the primary spines, which in proportion to the length of the test are nearly as long as those of *Linopneustes*. Above the ambitus the test is covered by minute miliaries, scattered uniformly over the surface of the coronal plates. The primary tubercles are placed uniformly over the abactinal part of the test both in the ambulacral and interambulacral areas. They are somewhat more closely placed near the ambitus and in the interambulacral areas of the actinal surface they are closely packed, forming a distinct actinal plastron in the odd interambulacrum. The phyllodes extend to the sixth or seventh pore from the actinostome. It is interesting to note that there are quite well developed “bourrelets” separating the ambulacral areas, a feature characteristic of such genera as *Conolampas*, *Conoclypus*, *Echinolampas*, and the like.

Station No. 3431, off Altata, Gulf of California, in 995 fathoms.

### *Cystechinus Loveni* A. Ag.

#### Plate IX.

The test of this species is comparatively stout; it is closely allied to *Cystechinus Wyvillii*, but can at once be distinguished from it by its transverse anal system (it is longitudinal both in *C. Wyvillii* and *C. clypeatus*), by the great size of the actinal interambulacral plate of the actinal plastron, and by the structure of the apical system which is intermediate between that of *C. clypeatus* and *C. Wyvillii* (Challenger Echini, Plate XXIX.<sup>b</sup> Fig. 1, and Plate XXXV.<sup>b</sup> Fig. 10).

Station No. 3415, off Acapulco, in 1879 fathoms.

### *Cystechinus Rathbuni* A. Ag.

#### Plate X.

A number of specimens in excellent condition were dredged from the two localities at which this species was procured. The test of this species is thinner than in *C. Loveni*, but somewhat thicker than in *C. vesica*. A few of the specimens came up which had preserved their shape, so we are able to give figures

of the outlines of the group of *Cystechinus* allied to *C. vesica*. The specimens collected varied from a brilliant dark violet to a light claret color.

The anal system is very large, placed well above the ambitus. On the actinal side, the primary tuberculation of the test is smaller and less crowded than in *C. vesica*. There are four genital pores in all the specimens collected; another feature distinguishing it from *C. vesica*.

Station No. 3360, southwest of Mariato Point, in 1672 fathoms.

“ “ 3374, southwest of Malpelo Island, in 1823 fathoms.

## ANANCHYTIDÆ, ALB. GRAS.

### PHRISSOCYSTIS, A. AG.

This genus is allied to *Palæotropus* and *Palæobrissus* in having like them a simple ambulacral system, without even the slight trace of petaloid arrangement found in *Palæobrissus*. The petals are perhaps even more like those of *Cystechinus*, *Echinocrepis*, *Gonicopatagus*, *Calymne*, and the like. At the actinosome, however, the phyllodes attain an extraordinary development, recalling those of *Paleopneustes* and *Linopneustes*. The apical system is compact, similar to that of the genera last named, and the primary spines are long and curved, recalling those of the same genera.

### *Phrissocystis aculeata* A. Ag.

Plate XII. Figs. 1-7.

Although not a single complete specimen of this species was obtained, a sufficient number of larger fragments were collected to enable us to reconstruct fairly accurately this interesting sea-urchin. Its general facies must have been similar to the species of *Linopneustes* and of *Paleopneustes*. The test is thin, covered with large distant primary radioles of uniform size. The outline of the test must have been somewhat conical, the apex slightly eccentric posteriorly, the oral plastron very prominent and flanked by the wide bare areas of the posterior ambulacra. The apical system compact, with four large genital openings; the madreporic body covers the whole of the posterior part of the apical system, and surrounds the anterior genital pores. The ocular plates are small but distinct, with large pores. The smaller plates of the abactinal part of the ambulacral areas are bare, the larger plates carry first one, and at the ambitus there are from eight to ten distant primaries. In the odd interambulacrum there is a slight median furrow extending a short distance from the apex to the anal system. The whole test is covered with distant miliaries irregularly scattered over the coronal plates. The anal system is transversely elliptical and protected by a number of irregularly shaped plates; the phyllodes are greatly developed. The largest specimens must have been 100 mm. in length, and 50 mm. in height, and from 80 to 90 mm. in width across the anterior half of the posterior interambulacral area.

Station No. 3366, in 1067 fathoms.

**Homolampas hastata A. Ag.****Plate XI. Fig. 1.**

This species is distinguished by the great distinctness and sharpness of its peripetalous fasciole, which is somewhat pentagonal in outline, and surrounds the few primary tubercles found near the apical extremity. The plates of both of the ambulacral and interambulacral areas of the abactinal part of the test are covered by small secondaries and miliaries; this tuberculation is closer than in any other species of the genus; the posterior extremity is more vertically truncated, and the anal groove not so pronounced as in *H. fulva*. The anal system is pyriform, its greatest diameter being transverse, as in *H. fragilis*. There are only two of the larger primary tubercles in the lateral interambulacra carrying long curved spines.

Station No. 3363, northeast of Cocos Island, in 976 fathoms.

“ “ 3365, northeast of Cocos Island, in 1010 fathoms.

“ “ 3376, South of Malpelo, in 1132 fathoms.

**BRISSINA GRAY.****Aërope fulva A. Ag.****Plate VIII. Figs. 5, 6.**

This species is readily distinguished from the other species of the genus by its proportionally greater length, the lateral flattening of the test, and the pointed anal rostrum. The tuberculation is also closer, and the primary spines are slender in comparison with the stouter spines of *Aërope rostrata*. The anal plastron is elongate, triangular, closely packed with primaries, the actinostome longitudinally elliptical. The anal system is somewhat pyriform, with the anal opening in the posterior part of the anal system.

Station No. 3361, on way to Cocos Island from Mariato Pt., in 1471 fathoms.

“ “ 3362, on way to Cocos Island from Mariato Pt., in 1175 fathoms.

“ “ 3381, north of Malpelo Island, in 1772 fathoms.

“ “ 3398, off Galera Point, in 1573 fathoms.

“ “ 3399, off Galera Point, in 1740 fathoms.

**Schizaster latifrons A. Ag.****Plate XI. Figs. 2, 3.**

At Station 3431, in 995 fathoms, were collected specimens of a species of *Schizaster* remarkable for the great development of the anterior extremity, the breadth of the anterior ambulacrum, and the short posterior pair of ambulacral petals. This species belongs to the *Schizaster* group, of which *S. Philippii* is a well known representative.

**Schizaster Townsendi A. Ag.**

A large series of this species was collected during our cruise from a number of localities. It is marked by the flatness of the test and the great width of all the lateral ambulacra, the small size of the anal system, the close primary tuberculation of the actinal plastron, which is in striking contrast to the bare actinal surface.

|                   |                            |              |
|-------------------|----------------------------|--------------|
| Station No. 3394. | Gulf of Panama.            | 511 fathoms. |
| " " 3419.         | " "                        | " "          |
| " " 3424.         | " "                        | 674 "        |
| " " 3425.         | " "                        | 680 "        |
| " " 3426.         | " "                        | 146 "        |
| " " 3431.         | " "                        | 995 "        |
| " " 3436.         | " "                        | 905 "        |
| " " 3437.         | 50 miles south of Guaymas. | 628 "        |

**Periaster tenuis A. Ag.**

Plate XI. Figs. 6, 7.

This species is much flatter and less globular than the species from the Gulf of Mexico (*P. limicola*). It has no anal fasciole; the peripetalous fasciole is wide, with prominent miliaries; the actinal plastron is elongated, and the tuberculation of the test close. In life the color of the test is light brown.

|                   |                   |               |
|-------------------|-------------------|---------------|
| Station No. 3381. | Off Galera Point. | 1772 fathoms. |
| " " 3398.         | " " "             | 1573 "        |
| " " 3399.         | " " "             | 1743 "        |

**Brissopsis columbaris A. Ag.**

The Pacific *Brissopsis* is readily distinguished from the Atlantic species by the great length of the lateral ambulacra, the flatness of the test, and the great width of the area enclosed by the subanal fasciole. The anal extremity of the test is also more sloping than in the European species, and characterized by the great size of the anal system. The great variation found in specimens of the genus both on the Atlantic and Pacific sides of the Isthmus of Panama leads me to think that there has been some confusion in referring to *Brissopsis* such elongate types of *Spatangoids* as I figure on Plate XXVI. Figure 7 of the Blake Echini.<sup>1</sup> I shall refer to this again in my final Report on the Albatross Echini.

|                   |                          |
|-------------------|--------------------------|
| Station No. 3353. | 695 fathoms.             |
| " " 3356.         | Off Mariato Point. 546 " |
| " " 3382.         | Off Mala Point. 1793 "   |
| " " 3394.         | Panama Bay. 511 "        |

<sup>1</sup> Mem. Mus. Comp. Zool., Vol. X., No. 1, 1883.

**Toxobrissus pacificus A. Ag.****Plate XI. Figs. 4, 5.**

There occurs in the Pacific a Spatangoid which has been regarded as allied to Brissus. Specimens of it are known to me from the Sandwich Islands and from Zanzibar. A species closely allied to the above mentioned specimens has been dredged off Point Mala, at Station No. 3355, in 182 fathoms. I am inclined at present to place these specimens in the genus *Toxobrissus* of Desor. The species dredged by the Albatross are marked for the flatness of the test, the confluence of the posterior ambulacra along the median line for nearly half their length, the great width of the posterior extremity of the test, the large and uniform size of the posterior ambulacral plates on the actinal side of the test, as well as the small size of the actinal plastron.

**SPATAGODESMA, A. Ag.****Plate XII. Fig. 8.**

From Station 2769, during the voyage of the "Albatross" from New York to San Francisco, were obtained specimens of a small species of Spatangoid, in which the character of the apical fasciole differs widely from that of any Spatangoid known to me. It possesses a broad elliptical fasciole encircling both the ambulacra and the anal system. A transverse band divides the fasciole into two areas, one enclosing the anal system and the other becoming the peripetalous fasciole. Such a fasciole is unknown to me, and among the young Spatangoids I have had occasion to examine nothing similar exists. The nearest approach to the fasciole of this genus, for which I propose the name *Spatagodesma*, seems to exist in the young of *Agassizia*, in which an imperfect subanal fasciole branches off from the peripetalous fasciole. The actinostome is still quite central, and no prominent posterior labrum is as yet developed in the largest specimen, which is about 7 mm. in length. I have not yet been able to satisfy myself of the relations of this interesting Spatangoid.



## EXPLANATION OF THE PLATES.

## PLATE I.

Fig. 1. *Dorocidaris panamensis* A. Ag., from the abactinal side.

Fig. 2. *Dorocidaris panamensis* A. Ag., from the actinal side.

All figures natural size.

## PLATE II.

Fig. 1. *Dorocidaris panamensis* A. Ag., facing the odd anterior ambulacrum.

Fig. 2. *Salenia miliaris* A. Ag., abactinal view.

Fig. 3. *Salenia miliaris* A. Ag., partly denuded.

Fig. 4. *Salenia miliaris* A. Ag., facing the odd anterior ambulacrum.

All figures natural size.

## PLATE III.

Fig. 1. *Goniocidaris Doederleini* A. Ag., from the abactinal side.

Fig. 2. *Porocidaris Cobosi* A. Ag., in profile.

Fig. 3. *Porocidaris Cobosi* A. Ag., from the actinal side.

Fig. 4. *Porocidaris Cobosi* A. Ag., facing the posterior interambulacrum.

Fig. 5. *Porocidaris Cobosi* A. Ag., from the abactinal side.

All figures natural size.

## PLATE IV.

Fig. 1. *Porocidaris Milleri* A. Ag., (female) test, seen from the abactinal side.

Fig. 2. *Porocidaris Milleri* A. Ag., from the actinal side.

All figures natural size.

## PLATE V.

Fig. 1. *Dialithocidaris gemmifera* A. Ag., from the abactinal side.

Fig. 2. *Dialithocidaris gemmifera* A. Ag., facing the odd anterior ambulacrum.

Fig. 3. *Dermatodiadema globulosum* A. Ag., from the abactinal side.

Fig. 4. *Dermatodiadema globulosum* A. Ag., facing the odd anterior ambulacrum.

Fig. 5. *Dermatodiadema horridum* A. Ag., from the abactinal side.

Fig. 6. *Dermatodiadema horridum* A. Ag., in profile.

Fig. 7. *Dermatodiadema horridum* A. Ag., facing the left anterior ambulacrum.

All figures natural size.

## PLATE VI.

Fig. 1. *Phormosoma hispidum* A. Ag., from the abactinal side, odd anterior ambulacrum on the left.

Fig. 2. *Phormosoma hispidum* A. Ag., (a larger specimen,) from the abactinal side, odd anterior ambulacrum on the left.

All figures natural size.

## PLATE VII.

Fig. 1. *Phormosoma hispidum* A. Ag., (same as Fig. 1, Pl. VI.,) from the actinal side, odd anterior ambulacrum on the left.

Fig. 2. *Phormosoma hispidum* A. Ag., from the actinal side, odd anterior ambulacrum on the left.

All figures natural size.

## PLATE VIII.

Fig. 1. *Pourtalesia Tanneri* A. Ag., from the abactinal side.

Fig. 2. *Pourtalesia Tanneri* A. Ag., in profile.

Fig. 3. *Plexechinus cinctus* A. Ag., in profile.

Fig. 4. *Plexechinus cinctus* A. Ag., from the abactinal side.

Fig. 5. *Aërope fulva* A. Ag., from the abactinal side.

Fig. 6. *Aërope fulva* A. Ag., in profile.

Fig. 7. *Urechinus giganteus* A. Ag., from the abactinal side.

Fig. 8. *Urechinus giganteus* A. Ag., in profile.

All figures natural size.

## PLATE IX.

Fig. 1. *Cystechinus Loveni* A. Ag., in profile.

Fig. 2. *Cystechinus Loveni* A. Ag., from the abactinal side.

All figures natural size.

## PLATE X.

Fig. 1. *Cystechinus Rathbuni* A. Ag., facing the anal system.

Fig. 2. *Cystechinus Rathbuni* A. Ag., from the abactinal side.

All figures natural size.

## PLATE XI.

Fig. 1. *Homolampas hastata* A. Ag., from the abactinal side.

Fig. 2. *Schizaster latifrons* A. Ag., from the abactinal side.

Fig. 3. *Schizaster latifrons* A. Ag., from the actinal side.

Fig. 4. *Toxobrissus pacificus* A. Ag., from the abactinal side.

Fig. 5. *Toxobrissus pacificus* A. Ag., from the actinal side.

Fig. 6. *Periaster tennis* A. Ag., from the abactinal side.

Fig. 7. *Periaster tennis* A. Ag., from the actinal side.

All figures natural size.

## PLATE XII.

- Fig. 1. *Phrissocystis aculeata* A. Ag., apical part of test.  
Fig. 2. *Phrissocystis aculeata* A. Ag., odd interambulacral area.  
Fig. 3. *Phrissocystis aculeata* A. Ag., odd ambulacrum.  
Fig. 4. *Phrissocystis aculeata* A. Ag., left posterior ambulacrum.  
Fig. 5. *Phrissocystis aculeata* A. Ag., part of left side of test.  
Fig. 6. *Phrissocystis aculeata* A. Ag., anal system.  
Fig. 7. *Phrissocystis aculeata* A. Ag., actinal system.

Figs. 1-7 natural size.

- Fig. 8. Fasciole of *Spatagodesma*.  $\frac{7}{8}$ .

## PLATE XIII.

- Fig. 1. *Echinocrepis setigera* A. Ag., apical part of test.  
Fig. 2. *Echinocrepis setigera* A. Ag., odd anterior ambulacrum from above.  
Fig. 3. *Echinocrepis setigera* A. Ag., odd anterior ambulacrum from below.  
Fig. 4. *Echinocrepis setigera* A. Ag., posterior interambulacrum from above.  
Fig. 5. *Echinocrepis setigera* A. Ag., anal proboscis in profile.  
Fig. 6. *Echinocrepis setigera* A. Ag., anal system from below.

All figures natural size.

## PLATE A.

CHART SHOWING THE TRACK OF THE "ALBATROSS."